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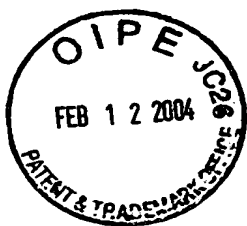
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PATENT APPLICATION  
Mo-6418  
MD-01-49-PU

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION OF )  
JAN L. R. CLATTY ) GROUP: 1711  
SERIAL NO.: 09/876,778 ) EXAMINER: J. M. COONEY  
FILED: JUNE 7, 2001 )  
TITLE: POLYURETHANE FOAMS HAVING )  
IMPROVED HEAT SAG AND A )  
PROCESS FOR THEIR )  
PRODUCTION )

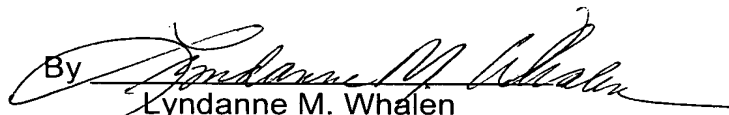
LETTER

Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Enclosed herewith are three copies of an Appeal Brief in the matter of the subject Appeal. Please charge the fee for filing the Brief, \$330.00, to our Deposit Account Number 13-3848.

Respectfully submitted

By   
Lyndanne M. Whalen  
Attorney for Appellant  
Reg. No. 29,457

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Patents, Alexandria, VA 22313-1450 02/10/04  
Date

Lyndanne M. Whalen, Reg. No. 29,457  
Name of applicant, assignee or Registered Representative

  
Signature

February 10, 2004  
Date



PATENT APPLICATION  
Mo-6418  
MD-01-49-PU

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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IMPROVED HEAT SAG AND A )  
PROCESS FOR THEIR )  
PRODUCTION )

**APPEAL BRIEF**

Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

This Brief, submitted in triplicate, is an Appeal from the Final Action of the Examiner dated August 26, 2003 in which the rejections of Claims 1-7 (all of the pending claims) were maintained. A separate Request for Extension of Time under 37 C.F.R. 1.136(a) is enclosed so that this Appeal may be considered timely filed.

**I. REAL PARTY IN INTEREST**

The inventor assigned all of her rights to the present invention to Bayer Corporation, the predecessor of Bayer Polymers LLC. The real party in interest is therefore Bayer Polymers LLC.

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Date

Lyndanne M. Whalen, Reg. No. 29,457

Name of applicant, assignee or Registered Representative

Signature

February 10, 2004

Date

## **II. RELATED APPEALS AND INTERFERENCES**

There are no pending appeals or interferences of which Appellant is aware that would be affected by or have a bearing on the Board's decision in this Appeal.

## **III. STATUS OF CLAIMS**

Claims 1-7 remain pending and are the subject of this Appeal.

Claims 8-17 were cancelled, pursuant to a restriction requirement, in Appellant's Amendment filed December 16, 2002. These claims were presented in a divisional application which issued as U.S. Patent 6,649,667 on November 18, 2003.

## **IV. STATUS OF AMENDMENTS**

No amendments to the claims have been made or requested subsequent to the Final Action of the Examiner.

## **V. SUMMARY OF THE INVENTION**

The present invention relates to an isocyanate-reactive component useful for the production of a rigid closed cell polyurethane foam by a RIM process. The isocyanate-reactive component of the present invention includes from 0.5 to 30% by weight of a polyol based on vegetable oil, fish oil or oil derived from animal fat, from 5 to 80% by weight of another isocyanate-reactive material having a functionality of at least 1 and a number average molecular weight of from 400 to 10,000, a chain extender, a blowing agent and a catalyst.

## **VI. ISSUES**

- A. Claims 1-7 stand rejected under 35 U.S.C. § 102(b) as being anticipated by WO 00/23491.
- B. Claims 1-7 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kurth U.S. Patent 6,180,686.

## VII. GROUPING OF CLAIMS

- A. None of Claims 1-7 will be argued separately with respect to ISSUE A. Claims 1-7 therefore stand or fall together with respect to ISSUE A.
- B. None of Claims 1-7 will be argued separately with respect to ISSUE B. Claims 1-7 therefore stand or fall together with respect to ISSUE B.

## VIII. ARGUMENTS

### A. WO 00/23491 does not anticipate Appellant's Claims 1-7.

WO 00/23491 discloses isocyanate prepolymers produced with natural soya oil. (English language translation attached).

This reference does not disclose an **isocyanate-reactive** component which includes an isocyanate-reactive compound having a number average molecular weight of from 400 to 10,000, a chain extender or crosslinking agent, blowing agent and catalyst and soya oil that has **not** been reacted with an isocyanate.

Appellant's claimed isocyanate-reactive component must include a vegetable oil, fish oil or oil derived from animal fat.

The isocyanate-reactive groups of the soya oil used to produce the isocyanate-terminated prepolymer disclosed in WO 00/23491 are reacted with isocyanate groups to produce that prepolymer. The isocyanate-reactive groups present in the oil required in Appellant's claimed composition have not been reacted with an isocyanate. The reference prepolymers do not have the unreacted groups required in Appellants' claimed isocyanate-reactive component.

WO 00/23491 does not therefore disclose Appellant's invention and does not support a rejection of the claimed invention under 35 U.S.C. § 102(b).

In the Office Action dated August 26, 2003, the Examiner stated:

"Applicants' arguments have been considered, but the differences recited are not seen to be evident in the claims." (at page 2, lines 11-12)

Appellant would direct the Board's attention to line 1 of Claim 1 which reads in part "An **isocyanate-reactive** component ..." before the required components a), b), c), d) and e) are recited.

One skilled in the art would readily appreciate that a prepolymer having terminal isocyanate groups (i.e., an isocyanate-terminated prepolymer of the type disclosed in WO 00/23491) is not a component which will react with an isocyanate group of the type required in Appellant's claimed composition. (See, e.g., enclosed copy of page 20 taken from Oertel's Polyurethane Handbook.) WO 00/23491 does not therefore teach Appellant's invention.

Withdrawal of this rejection is therefore requested.

**B. Appellant's Claims 1-7 are not rendered obvious by the teachings of Kurth (U.S. 6,180,686).**

Kurth discloses urethane foams produced by reacting soy oil, an isocyanate and a cross linker. "The soy oil **replaces** the polyol typically generally required in the production of urethanes." (Abstract of U.S. 6,180,686)

Kurth does **not** teach or suggest component-b) of Appellant's claimed compositions, i.e., from 5 to 80% by weight of an isocyanate-reactive material having a functionality of at least 1 and a number average molecular weight of from 400 to 10,000 which is different from component a) (i.e., the vegetable oil, fish oil or oil derived from animal fat) .

Kurth does not teach or suggest use of any second isocyanate-reactive material having a molecular weight greater than or equal to 400.

The Examiner has argued that it would have been obvious for one having ordinary skill in the art to use the petrochemical based polyether polyols disclosed and **avoided** by Kurth in combination with the soy oil required by Kurth

"...for the purpose of imparting relative non-degradability to the products being produced therefrom in order to arrive at the products of applicant's claims with the expectation of success in the absence of a showing of new or unexpected results." (Office Action dated March 12, 2003 at page 4, lines 8-13)

Appellant respectfully disagrees.

To establish a proper *prima facie* case of obviousness, the Examiner must establish that one of ordinary skill in the art would have been motivated by the teachings of the prior art to modify that prior art in the manner necessary to "arrive at" the claimed invention.

Kurth does **not** teach that the disclosed foams have a degradation problem or any undesirable property. One skilled in the art reading this disclosure would not therefore be motivated by the teachings of this reference to ignore Kurth's teaching with respect to complete replacement of known polyols and include a known polyol **in addition to** the required soy oil.

The Examiner has argued:

"Kurth's negative teaching is sufficient enough that an ordinary practitioner would have sufficient motivation to utilize the avoided polyols of Kurth if avoidance of the well-known petroleum based polyols was not of central concern." (at page 2, line 18-page 3, line 2 of the Office Action dated August 26, 2003)

Appellant maintains that the assumption upon which the Examiner's argument is based is not consistent with the facts of this case. As is apparent from the discussion of the prior art in the Background of the Invention section of the present application, those skilled in the art have sought to develop processes using as a polyol component an unmodified renewable source such as a vegetable oil without sacrificing the physical properties of the product.

It can not logically be assumed that one skilled in the art seeking to use a renewable resource such as the soy oil disclosed by Kurth would be motivated by that same disclosure to use other materials which Kurth avoided.

The Examiner has argued that it would have been obvious to one skilled in the art to use a polyether based polyol in combination with the soy oil disclosed by Kurth for the purpose of imparting relative non-degradability to the products produced therefrom in view of the well known nature of the polyols excluded by the reference.

No factual basis for this argument is found in the teachings of Kurth. Nor has any other authority to support this argument been cited.

The **only** teachings in Kurth with respect to use of the known polyether and polyester polyols in the disclosed foam-forming systems are directed to the fact that these known polyols are being replaced by the disclosed vegetable oil(s). In fact, Kurth states:

"The present invention comprises a flexible or semi-rigid urethane foam that is the reaction product of at least an isocyanate, a vegetable oil, and a cross linking agent. **The reaction is free of petroleum-based polyester or polyether polyols.**" (emphasis added) (column 7, lines 4-8)

There is no teaching in the Kurth reference or any other cited authority which suggests use of **any** known polyether or polyester polyol in combination with the oil required in Appellant's claimed composition. Absent such teaching and/or authority, the Examiner's arguments are conclusions with no factual basis. Such unsupported speculation does not, however, provide a proper basis for a rejection under 35 U.S.C. § 103.

Withdrawal of this rejection is therefore requested.

#### IX. CONCLUSION

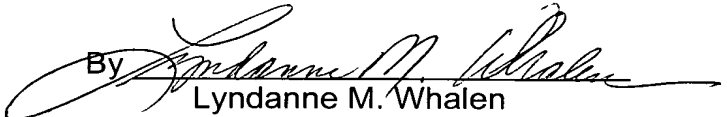
A compound formed by reacting an isocyanate with soybean oil to produce an isocyanate terminated prepolymer (as disclosed in WO 00/23491) is **not** a vegetable oil, fish oil or oil derived from animal fat. WO 00/23491 does not therefore anticipate Appellant's claimed invention.

A reference which teaches that use of materials such as polyether polyols and polyester polyols can be avoided by using soybean oil would **not** motivate one skilled in the art to ignore the teachings of that reference and use a mixture of soybean oil and a polyether or polyester polyol. The teachings of the Kurth reference would not therefore lead one of ordinary skill in the art to Appellant's claimed invention. Appellant's invention is not therefore rendered obvious by the teachings of Kurth.



Appellant therefore maintains that each of the Examiner's rejections is in error and respectfully requests that each of these rejections be reversed and that Claims 1-7 be allowed.

Respectfully submitted,

By   
Lyndanne M. Whalen  
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Reg. No. 29,457

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## APPENDIX - CLAIMS ON APPEAL

1. An isocyanate-reactive component useful for the production of a rigid closed cell polyurethane foam by a RIM process comprising:
  - a) from 0.5 to 30% by weight, based on total weight of isocyanate-reactive component, of a polyol based on vegetable oil, fish oil or oil derived from animal fat,
  - b) from 5 to 80% by weight, based on total weight of isocyanate-reactive component, of an isocyanate-reactive material which is different from a) having a functionality of at least 1 and a number average molecular weight of from 400 to 10,000,
  - c) a chain extender or a crosslinking agent,
  - d) a blowing agent, and
  - e) a catalyst.
2. The isocyanate-reactive component of Claim 1 in which up to 25% by weight of the total isocyanate reactive-component is a).
3. The isocyanate-reactive component of Claim 1 in which up to 20% by weight of the total isocyanate-reactive component is a).
4. The isocyanate-reactive component of Claim 1 in which at least 0.5% by weight of the total isocyanate-reactive component is a).
5. The isocyanate-reactive component of Claim 1 in which at least 5% by weight of the total isocyanate-reactive component is a).
6. The isocyanate-reactive component of Claim 1 in which a) is a blown soybean oil.

7. An isocyanate-reactive component useful for the production of a rigid closed cell polyurethane foam by a RIM process comprising

- a) at least 10% by weight, based on total weight of isocyanate reactive component, of a soybean oil based polyol,
- b) from 5 to 80% by weight, based on total weight of isocyanate-reactive component of a polyether polyol having a functionality of from 2 to 8 and a number average molecular weight of from 400 to 10,000,
- c) from 1 to 75% by weight, based on total weight of isocyanate-reactive component of a chain extender,
- d) water, and
- e) a catalyst.

PCT

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INTERNATIONAL APPLICATION, PUBLISHED IN ACCORDANCE WITH  
THE INTERNATIONAL PATENT COOPERATION TREATY (PCT)

INTERNATIONAL PUBLICATION NUMBER	(11):	WO 00/23491
INTERNATIONAL PATENT CLASSIFICATION <sup>7</sup>	(51):	C08G 18/36 C08G 18/12 C08J 9/08
INTERNATIONAL APPLICATION NUMBER	(21):	PCT/EP99/03959
INTERNATIONAL PUBLICATION DATE	(43):	June 8, 1999 (19990608)
PRIORITY DATA	(30):	102214 October 15, 1998 (19981015) PT
APPLICANT AND INVENTOR	(71) (72):	STIELAU, Martin [DE/PT] Melides Caveira, P-7570 Grandola (PT)
ATTORNEY	(74):	HAFT, VON PUTTKAMER, BERNGRUBER, CZYBULKA Franziskanerstrasse 38 D-81669 München (Munich) (DE)
CONTRACTING STATES	(81):	AU, BR, CN, IN, JP, MX, US, EUROPEAN PATENT (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
		<b>Published</b> with International Search Report
TITLE	(54):	METHOD FOR PRODUCING POLYURETHANE
FOREIGN TITLE	[54A]:	VERFAHREN ZUR HERSTELLUNG VON POLYURETHAN
ABSTRACT	(54)	A method for producing polyurethane pre-polymers and foamed plastics, using natural soya oil. Soya oil forms OH groups in the presence of a polyol in a pre-polymerization process. Said OH groups react with NCO groups of an isocyanate.

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### **Method for Producing Polyurethane**

This present invention concerns a method for producing polyurethane, including polyurethane pre-polymers. This present invention furthermore concerns the use of the polyurethane and/or pre-polymer that are produced in accordance with this present invention.

It is known from prior art to convert castor oil, i.e. a natural raw material, to polyurethane by using polyisocyanate. Ricinoleic acid glyceride, i.e. a triol with approx. 5.2% of reactive OH groups, accounts for between 80 and 85 percent by weight of castor oil. Because of the high OH value, however, the conversion of castor oil requires a large quantity of polyisocyanate, which leads to high production costs.

In Portuguese Patent 86.688, this present inventor already proposed vegetable oils without OH groups as particular suitable softeners in pre-polymers. Insofar as soya oil epoxide is concerned, the technique according to which polyols are obtained by partially opening the oxirane ring with alcohol is known from prior art.

The object of this present invention is to reduce the costs of producing polyurethane.

In accordance with this present invention, this is achieved by converting the polyisocyanate with a polyol, such as castor oil, in the presence of soya oil.

Mixtures of polyols, in particular mixtures of castor oil with soya oil, are inexpensive and less viscous when mixed with polyisocyanates.

While, at first glance, soya oil appears to be acting as a softener, after the reaction of the excessive polyisocyanate, firm bonding of soya oil occurs with other OH groups.

In accordance with this present invention, it was found that natural soya oil is converted into a polyol during the production of polyurethane pre-polymers and foamed plastics. This means that, during the pre-polymerization process, in the presence of a polyol, natural soya oil forms OH groups which react with the NCO groups of the polyisocyanate.

It was found that a mixture of castor oil and soya oil with a corresponding quantity of polyisocyanate full hardens after pre-polymerization when exposed to air humidity, which means that the soya oil, which initially does not react with isocyanates, has been converted into a polyol during the reaction of the excessive isocyanate.

As polyisocyanates, diisocyanates are preferably used, for example 4,4'-methylene di(phenylisocyanate). In accordance with this present invention, triols are particularly used as polyols, preferably castor oil.

Soya oil is preferably used in a weight ratio of between 0.2 and 5, in particular between 0.5 and 2 parts and, particularly preferably, of approx. one part for each part by weight of castor oil.

Based on the polyol, soya oil is preferably used in a quantity of between 10 g and 300 g, in particular between 70 g and 200 g, for each OH mol equivalent of the polyol. The term "one OH mol-equivalent" refers to the molecular weight of the polyol, divided by its (reactive) OH groups.

The molar ratio between the NCO groups of the polyisocyanate and the OH groups of the polyol is preferably between 1 and 4 to 1, in particular between 2 and 3 to 1.

Preferably, the polyisocyanate is initially converted to a pre-polymer with free isocyanate groups by using the polyol and the soya oil. To achieve this, during the reaction with the polyol and the soya oil, the polyisocyanate is placed in a stoichiometric surplus, which, for example, is chosen in such a manner that between 3% and 30%, in particular approx. 10% of the NCO groups, are not converted.

The resulting pre-polymer can be hardened by adding compounds with acidic OH groups, in particular water, by converting the excessive, free isocyanate groups. Prior-art catalysts for polyurethane production, z. B. dibutyl tin dilaurate (DBTL), may also be used for that purpose.

### **Example 1**

100 g of castor oil are mixed with 100 g of soya oil. While stirring, the mixture is heated to approx. 150° C and maintained at this temperature for approx. 30 minutes. After cooling to approx. 70° C, approx. 200 g of MDI ("44V20", manufactured by Bayer) are added while stirring and without exposure to any humidity, and the entire mixture is maintained at 90° C for approx. one hour. The pre-polymer obtained thereby cures to form a very resistant film when exposed to air humidity.

### **Example 2**

100 g of the pre-polymer obtained as described in Example 1 are mixed with 5 g of water and 0.3 g of DBTL.



After an exothermal reaction, a hard foam is obtained which exhibits good strength and chemical properties.

### Claims

1. A method for producing polyurethane, wherein a polyisocyanate is converted by using a polyol, characterized in that the conversion of the polyisocyanate with the polyol is performed in the presence of soya oil.
2. A method in accordance with Claim 1, characterized in that the soya oil is used in a quantity of between 10 g and 300 g, based on the OH mol equivalent of the polyol.
3. A method in accordance with Claims 1 and 2, characterized in that the molar ratio between the NCO groups of the polyisocyanate and the OH groups of the polyol is between 1 and 4 to 1.
4. A method in accordance with one of the preceding Claims, characterized in that castor oil is used as a polyol.
5. A method in accordance with Claim 1, characterized in that, to produce a pre-polymer with free isocyanate groups, the polyisocyanate is used in the surplus during the conversion with the polyol and the soya oil.
6. A method in accordance with Claim 5, characterized in that the pre-polymer is converted with a compound containing acidic hydrogen.

7. The use of the polyurethane produced in accordance with one of the preceding Claims, characterized in the production of foamed plastics made of polyurethane.
8. The use in accordance with Claim 7, characterized in that the pre-polymer in accordance with Claim 6 is used in the production of foamed plastics made of polyurethane.

# Polyurethane Handbook

Chemistry — Raw Materials — Processing —  
Application — Properties

Edited by Dr. Günter Oertel

With 544 Figures and 121 Tables

With contributions from

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Dr. D. Dieterich, Dr. W. Dietrich, Prof. Dr. W. Diller, Dr. M. Dollhausen,  
Dr. F. Ehrhard, Dr. H.-A. Freitag, G. Gabrysch, Dr. H. Gall, Dr. W. Goyert,  
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### 2.3.1.2 Prepolymer process [59]

Within the nomenclature of PU chemistry, prepolymers are understood as intermediates of the isocyanate polyaddition reaction. Numerous PU elastomers and almost all polyurethane-ureas are prepared via NCO prepolymer intermediates. This method allows for the complete reaction even of low reactivity polyether diols in absence of catalysts and for the intentional preparation of a segmented structure. The reaction between a diisocyanate and a diol is a second order reaction and depends on the molar ratio of the components. This makes it possible to prepare intermediates with the desired end groups and a defined average molecular weight in statistical distribution.

The possibility to tailor-make any desirable intermediate by the polyaddition reaction is a very important advantage of the diisocyanate polyaddition process compared with other polymerization processes. Specifically products with terminal NCO groups, so-called NCO prepolymers, are of substantial technical importance as intermediates in the synthesis of polyurethanes because they can be used with a multitude of active hydrogen containing compounds. They are generated by the reaction of di- or poly-hydroxyl compounds with a molar excess of di- or polyisocyanates and yield homogenous mixtures which still contain a substantial percentage of the monomeric isocyanate. If diisocyanates with NCO groups of different reactivity are employed (2,4-diisocyanatotoluene, isophorondiisocyanate), NCO prepolymers with narrow molecular weight distribution and small amounts of the starting diisocyanate are obtained. In all other cases requiring low monomer content, the excess diisocyanate has to be removed by distillation (preferably by thin layer evaporation) or extraction. If the NCO/OH ratio in the prepolymer preparation is greater than ca. three, the resulting products are called semiprepolymers, because only a part of the available isocyanate is involved in the prepolymer formation. A lot of so-called "modified isocyanates" are this type of semi-prepolymers.

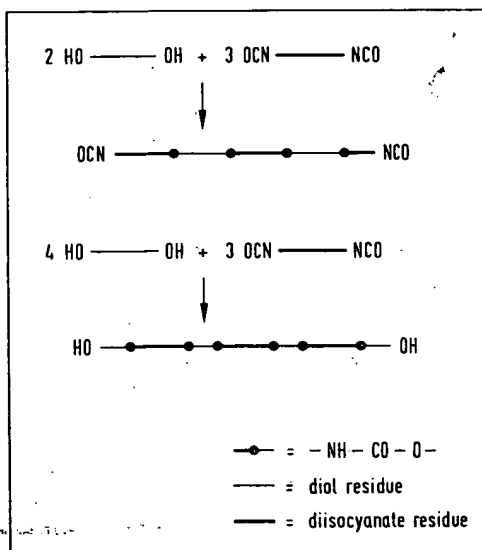


Fig. 2.1. NCO prepolymers and OH prepolymers

### Polyurethane ureas [58]

The chain extension of NCO prepolymers with diamines is of substantial importance because the resulting polyurethane polyureas are characterized by a high quality property level and reduced thermoplasticity. Generally aromatic diamines of low reactivity, which are sterically



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I. **REAL PARTY IN INTEREST**

The inventor assigned all of her rights to the present invention to Bayer Corporation, the predecessor of Bayer Polymers LLC. The real party in interest is therefore Bayer Polymers LLC.

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Lyndanne M. Whalen, Reg. No. 29,457

Name of applicant, assignee or Registered Representative

  
Signature

February 10, 2004  
Date

## II. RELATED APPEALS AND INTERFERENCES

There are no pending appeals or interferences of which Appellant is aware that would be affected by or have a bearing on the Board's decision in this Appeal.

## III. STATUS OF CLAIMS

Claims 1-7 remain pending and are the subject of this Appeal.

Claims 8-17 were cancelled, pursuant to a restriction requirement, in Appellant's Amendment filed December 16, 2002. These claims were presented in a divisional application which issued as U.S. Patent 6,649,667 on November 18, 2003.

## IV. STATUS OF AMENDMENTS

No amendments to the claims have been made or requested subsequent to the Final Action of the Examiner.

## V. SUMMARY OF THE INVENTION

The present invention relates to an isocyanate-reactive component useful for the production of a rigid closed cell polyurethane foam by a RIM process. The isocyanate-reactive component of the present invention includes from 0.5 to 30% by weight of a polyol based on vegetable oil, fish oil or oil derived from animal fat, from 5 to 80% by weight of another isocyanate-reactive material having a functionality of at least 1 and a number average molecular weight of from 400 to 10,000, a chain extender, a blowing agent and a catalyst.

## VI. ISSUES

- A. Claims 1-7 stand rejected under 35 U.S.C. § 102(b) as being anticipated by WO 00/23491.
- B. Claims 1-7 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kurth U.S. Patent 6,180,686.

## VII. GROUPING OF CLAIMS

- A. None of Claims 1-7 will be argued separately with respect to ISSUE A. Claims 1-7 therefore stand or fall together with respect to ISSUE A.
- B. None of Claims 1-7 will be argued separately with respect to ISSUE B. Claims 1-7 therefore stand or fall together with respect to ISSUE B.

## VIII. ARGUMENTS

### A. WO 00/23491 does not anticipate Appellant's Claims 1-7.

WO 00/23491 discloses isocyanate prepolymers produced with natural soya oil. (English language translation attached).

This reference does not disclose an **isocyanate-reactive** component which includes an isocyanate-reactive compound having a number average molecular weight of from 400 to 10,000, a chain extender or crosslinking agent, blowing agent and catalyst and soya oil that has **not** been reacted with an isocyanate.

Appellant's claimed isocyanate-reactive component must include a vegetable oil, fish oil or oil derived from animal fat.

The isocyanate-reactive groups of the soya oil used to produce the isocyanate-terminated prepolymer disclosed in WO 00/23491 are reacted with isocyanate groups to produce that prepolymer. The isocyanate-reactive groups present in the oil required in Appellant's claimed composition have not been reacted with an isocyanate. The reference prepolymers do not have the unreacted groups required in Appellants' claimed isocyanate-reactive component.

WO 00/23491 does not therefore disclose Appellant's invention and does not support a rejection of the claimed invention under 35 U.S.C. § 102(b).

In the Office Action dated August 26, 2003, the Examiner stated:

"Applicants' arguments have been considered, but the differences recited are not seen to be evident in the claims." (at page 2, lines 11-12)

Appellant would direct the Board's attention to line 1 of Claim 1 which reads in part "An **isocyanate-reactive** component ..." before the required components a), b), c), d) and e) are recited.



One skilled in the art would readily appreciate that a prepolymer having terminal isocyanate groups (i.e., an isocyanate-terminated prepolymer of the type disclosed in WO 00/23491) is not a component which will react with an isocyanate group of the type required in Appellant's claimed composition. (See, e.g., enclosed copy of page 20 taken from Oertel's Polyurethane Handbook.) WO 00/23491 does not therefore teach Appellant's invention.

Withdrawal of this rejection is therefore requested.

B. Appellant's Claims 1-7 are not rendered obvious by the teachings of Kurth (U.S. 6,180,686).

Kurth discloses urethane foams produced by reacting soy oil, an isocyanate and a cross linker. "The soy oil **replaces** the polyol typically generally required in the production of urethanes." (Abstract of U.S. 6,180,686)

Kurth does **not** teach or suggest component b) of Appellant's claimed compositions, i.e., from 5 to 80% by weight of an isocyanate-reactive material having a functionality of at least 1 and a number average molecular weight of from 400 to 10,000 which is different from component a) (i.e., the vegetable oil, fish oil or oil derived from animal fat) .

Kurth does not teach or suggest use of any second isocyanate-reactive material having a molecular weight greater than or equal to 400.

The Examiner has argued that it would have been obvious for one having ordinary skill in the art to use the petrochemical based polyether polyols disclosed and **avoided** by Kurth in combination with the soy oil required by Kurth

"...for the purpose of imparting relative non-degradability to the products being produced therefrom in order to arrive at the products of applicant's claims with the expectation of success in the absence of a showing of new or unexpected results." (Office Action dated March 12, 2003 at page 4, lines 8-13)

Appellant respectfully disagrees.

To establish a proper *prima facie* case of obviousness, the Examiner must establish that one of ordinary skill in the art would have been motivated by the teachings of the prior art to modify that prior art in the manner necessary to "arrive at" the claimed invention.

Kurth does **not** teach that the disclosed foams have a degradation problem or any undesirable property. One skilled in the art reading this disclosure would not therefore be motivated by the teachings of this reference to ignore Kurth's teaching with respect to complete replacement of known polyols and include a known polyol **in addition to** the required soy oil.

The Examiner has argued:

"Kurth's negative teaching is sufficient enough that an ordinary practitioner would have sufficient motivation to utilize the avoided polyols of Kurth if avoidance of the well-known petroleum based polyols was not of central concern." (at page 2, line 18-page 3, line 2 of the Office Action dated August 26, 2003)

Appellant maintains that the assumption upon which the Examiner's argument is based is not consistent with the facts of this case. As is apparent from the discussion of the prior art in the Background of the Invention section of the present application, those skilled in the art have sought to develop processes using as a polyol component an unmodified renewable source such as a vegetable oil without sacrificing the physical properties of the product.

It can not logically be assumed that one skilled in the art seeking to use a renewable resource such as the soy oil disclosed by Kurth would be motivated by that same disclosure to use other materials which Kurth avoided.

The Examiner has argued that it would have been obvious to one skilled in the art to use a polyether based polyol in combination with the soy oil disclosed by Kurth for the purpose of imparting relative non-degradability to the products produced therefrom in view of the well known nature of the polyols excluded by the reference.

No factual basis for this argument is found in the teachings of Kurth. Nor has any other authority to support this argument been cited.

The **only** teachings in Kurth with respect to use of the known polyether and polyester polyols in the disclosed foam-forming systems are directed to the fact that these known polyols are being replaced by the disclosed vegetable oil(s). In fact, Kurth states:

"The present invention comprises a flexible or semi-rigid urethane foam that is the reaction product of at least an isocyanate, a vegetable oil, and a cross linking agent. **The reaction is free of petroleum-based polyester or polyether polyols.**" (emphasis added) (column 7, lines 4-8)

There is no teaching in the Kurth reference or any other cited authority which suggests use of **any** known polyether or polyester polyol in combination with the oil required in Appellant's claimed composition. Absent such teaching and/or authority, the Examiner's arguments are conclusions with no factual basis. Such unsupported speculation does not, however, provide a proper basis for a rejection under 35 U.S.C. § 103.

Withdrawal of this rejection is therefore requested.

#### IX. CONCLUSION

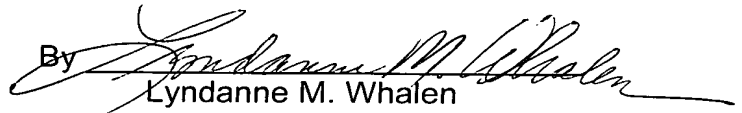
A compound formed by reacting an isocyanate with soybean oil to produce an isocyanate terminated prepolymer (as disclosed in WO 00/23491) is **not** a vegetable oil, fish oil or oil derived from animal fat. WO 00/23491 does not therefore anticipate Appellant's claimed invention.

A reference which teaches that use of materials such as polyether polyols and polyester polyols can be avoided by using soybean oil would **not** motivate one skilled in the art to ignore the teachings of that reference and use a mixture of soybean oil and a polyether or polyester polyol. The teachings of the Kurth reference would not therefore lead one of ordinary skill in the art to Appellant's claimed invention. Appellant's invention is not therefore rendered obvious by the teachings of Kurth.

Appellant therefore maintains that each of the Examiner's rejections is in error and respectfully requests that each of these rejections be reversed and that Claims 1-7 be allowed.

Respectfully submitted,

By



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## APPENDIX - CLAIMS ON APPEAL

1. An isocyanate-reactive component useful for the production of a rigid closed cell polyurethane foam by a RIM process comprising:
  - a) from 0.5 to 30% by weight, based on total weight of isocyanate-reactive component, of a polyol based on vegetable oil, fish oil or oil derived from animal fat,
  - b) from 5 to 80% by weight, based on total weight of isocyanate-reactive component, of an isocyanate-reactive material which is different from a) having a functionality of at least 1 and a number average molecular weight of from 400 to 10,000,
  - c) a chain extender or a crosslinking agent,
  - d) a blowing agent, and
  - e) a catalyst.
2. The isocyanate-reactive component of Claim 1 in which up to 25% by weight of the total isocyanate reactive-component is a).
3. The isocyanate-reactive component of Claim 1 in which up to 20% by weight of the total isocyanate-reactive component is a).
4. The isocyanate-reactive component of Claim 1 in which at least 0.5% by weight of the total isocyanate-reactive component is a).
5. The isocyanate-reactive component of Claim 1 in which at least 5% by weight of the total isocyanate-reactive component is a).
6. The isocyanate-reactive component of Claim 1 in which a) is a blown soybean oil.

7. An isocyanate-reactive component useful for the production of a rigid closed cell polyurethane foam by a RIM process comprising

- a) at least 10% by weight, based on total weight of isocyanate reactive component, of a soybean oil based polyol,
- b) from 5 to 80% by weight, based on total weight of isocyanate-reactive component of a polyether polyol having a functionality of from 2 to 8 and a number average molecular weight of from 400 to 10,000,
- c) from 1 to 75% by weight, based on total weight of isocyanate-reactive component of a chain extender,
- d) water, and
- e) a catalyst.

PCT

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INTERNATIONAL APPLICATION, PUBLISHED IN ACCORDANCE WITH  
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TITLE	(54):	METHOD FOR PRODUCING POLYURETHANE
FOREIGN TITLE	[54A]:	VERFAHREN ZUR HERSTELLUNG VON POLYURETHAN
ABSTRACT	(54)	A method for producing polyurethane pre-polymers and foamed plastics, using natural soya oil. Soya oil forms OH groups in the presence of a polyol in a pre-polymerization process. Said OH groups react with NCO groups of an isocyanate.

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### **Method for Producing Polyurethane**

This present invention concerns a method for producing polyurethane, including polyurethane pre-polymers. This present invention furthermore concerns the use of the polyurethane and/or pre-polymer that are produced in accordance with this present invention.

It is known from prior art to convert castor oil, i.e. a natural raw material, to polyurethane by using polyisocyanate. Ricinoleic acid glyceride, i.e. a triol with approx. 5.2% of reactive OH groups, accounts for between 80 and 85 percent by weight of castor oil. Because of the high OH value, however, the conversion of castor oil requires a large quantity of polyisocyanate, which leads to high production costs.

In Portuguese Patent 86.688, this present inventor already proposed vegetable oils without OH groups as particular suitable softeners in pre-polymers. Insofar as soya oil epoxide is concerned, the technique according to which polyols are obtained by partially opening the oxirane ring with alcohol is known from prior art.

The object of this present invention is to reduce the costs of producing polyurethane.

In accordance with this present invention, this is achieved by converting the polyisocyanate with a polyol, such as castor oil, in the presence of soya oil.

Mixtures of polyols, in particular mixtures of castor oil with soya oil, are inexpensive and less viscous when mixed with polyisocyanates.

While, at first glance, soya oil appears to be acting as a softener, after the reaction of the excessive polyisocyanate, firm bonding of soya oil occurs with other OH groups.

In accordance with this present invention, it was found that natural soya oil is converted into a polyol during the production of polyurethane pre-polymers and foamed plastics. This means that, during the pre-polymerization process, in the presence of a polyol, natural soya oil forms OH groups which react with the NCO groups of the polyisocyanate.

It was found that a mixture of castor oil and soya oil with a corresponding quantity of polyisocyanate full hardens after pre-polymerization when exposed to air humidity, which means that the soya oil, which initially does not react with isocyanates, has been converted into a polyol during the reaction of the excessive isocyanate.

As polyisocyanates, diisocyanates are preferably used, for example 4,4'-methylene di(phenylisocyanate). In accordance with this present invention, triols are particularly used as polyols, preferably castor oil.

Soya oil is preferably used in a weight ratio of between 0.2 and 5, in particular between 0.5 and 2 parts and, particularly preferably, of approx. one part for each part by weight of castor oil.

Based on the polyol, soya oil is preferably used in a quantity of between 10 g and 300 g, in particular between 70 g and 200 g, for each OH mol equivalent of the polyol. The term "one OH mol-equivalent" refers to the molecular weight of the polyol, divided by its (reactive) OH groups.

The molar ratio between the NCO groups of the polyisocyanate and the OH groups of the polyol is preferably between 1 and 4 to 1, in particular between 2 and 3 to 1.

Preferably, the polyisocyanate is initially converted to a pre-polymer with free isocyanate groups by using the polyol and the soya oil. To achieve this, during the reaction with the polyol and the soya oil, the polyisocyanate is placed in a stoichiometric surplus, which, for example, is chosen in such a manner that between 3% and 30%, in particular approx. 10% of the NCO groups, are not converted.

The resulting pre-polymer can be hardened by adding compounds with acidic OH groups, in particular water, by converting the excessive, free isocyanate groups. Prior-art catalysts for polyurethane production, z. B. dibutyl tin dilaurate (DBTL), may also be used for that purpose.

### **Example 1**

100 g of castor oil are mixed with 100 g of soya oil. While stirring, the mixture is heated to approx. 150° C and maintained at this temperature for approx. 30 minutes. After cooling to approx. 70° C, approx. 200 g of MDI ("44V20", manufactured by Bayer) are added while stirring and without exposure to any humidity, and the entire mixture is maintained at 90° C for approx. one hour. The pre-polymer obtained thereby cures to form a very resistant film when exposed to air humidity.

### **Example 2**

100 g of the pre-polymer obtained as described in Example 1 are mixed with 5 g of water and 0.3 g of DBTL.

After an exothermal reaction, a hard foam is obtained which exhibits good strength and chemical properties.

**Claims**

1. A method for producing polyurethane, wherein a polyisocyanate is converted by using a polyol, characterized in that the conversion of the polyisocyanate with the polyol is performed in the presence of soya oil.
2. A method in accordance with Claim 1, characterized in that the soya oil is used in a quantity of between 10 g and 300 g, based on the OH mol equivalent of the polyol.
3. A method in accordance with Claims 1 and 2, characterized in that the molar ratio between the NCO groups of the polyisocyanate and the OH groups of the polyol is between 1 and 4 to 1.
4. A method in accordance with one of the preceding Claims, characterized in that castor oil is used as a polyol.
5. A method in accordance with Claim 1, characterized in that, to produce a pre-polymer with free isocyanate groups, the polyisocyanate is used in the surplus during the conversion with the polyol and the soya oil.
6. A method in accordance with Claim 5, characterized in that the pre-polymer is converted with a compound containing acidic hydrogen.

7. The use of the polyurethane produced in accordance with one of the preceding Claims, characterized in the production of foamed plastics made of polyurethane.
8. The use in accordance with Claim 7, characterized in that the pre-polymer in accordance with Claim 6 is used in the production of foamed plastics made of polyurethane.

# Polyurethane Handbook

Chemistry — Raw Materials — Processing —  
Application — Properties

Edited by Dr. Günter Oertel

With 544 Figures and 121 Tables

With contributions from

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### 2.3.1.2 Prepolymer process [59]

Within the nomenclature of PU chemistry, prepolymers are understood as intermediates of the isocyanate polyaddition reaction. Numerous PU elastomers and almost all polyurethane-ureas are prepared via NCO prepolymer intermediates. This method allows for the complete reaction even of low reactivity polyether diols in absence of catalysts and for the intentional preparation of a segmented structure. The reaction between a diisocyanate and a diol is a second order reaction and depends on the molar ratio of the components. This makes it possible to prepare intermediates with the desired end groups and a defined average molecular weight in statistical distribution.

The possibility to tailor-make any desirable intermediate by the polyaddition reaction is a very important advantage of the diisocyanate polyaddition process compared with other polymerization processes. Specifically products with terminal NCO groups, so-called NCO prepolymers, are of substantial technical importance as intermediates in the synthesis of polyurethanes because they can be used with a multitude of active hydrogen containing compounds. They are generated by the reaction of di- or poly-hydroxyl compounds with a molar excess of di- or polyisocyanates and yield homogenous mixtures which still contain a substantial percentage of the monomeric isocyanate. If diisocyanates with NCO groups of different reactivity are employed (2,4-diisocyanatotoluene, isophorondiisocyanate), NCO prepolymers with narrow molecular weight distribution and small amounts of the starting diisocyanate are obtained. In all other cases requiring low monomer content, the excess diisocyanate has to be removed by distillation (preferably by thin layer evaporation) or extraction. If the NCO/OH ratio in the prepolymer preparation is greater than ca. three, the resulting products are called semiprepolymers, because only a part of the available isocyanate is involved in the prepolymer formation. A lot of so-called "modified isocyanates" are this type of semi-prepolymers.

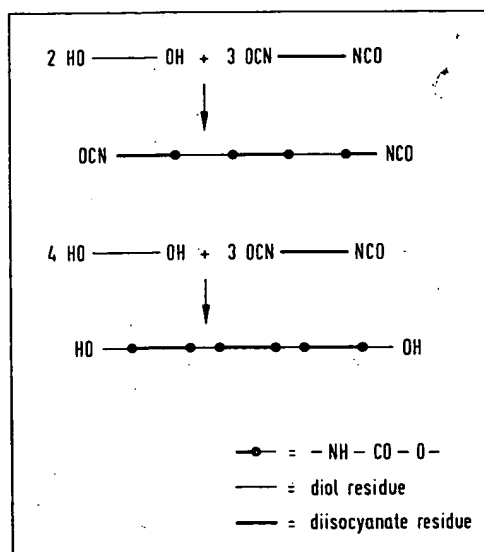


Fig. 2.1. NCO prepolymers and OH prepolymers

#### Polyurethane ureas [58]

The chain extension of NCO prepolymers with diamines is of substantial importance because the resulting polyurethane polyureas are characterized by a high quality property level and reduced thermoplasticity. Generally aromatic diamines of low reactivity, which are sterically